A Conservation Planning Guide for Native American Ranchers

DEVELOPED IN COOPERATION WITH THE 14R RANCH ON THE NAVAJO NATION, ARIZONA

A project funded with generous support from the U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) and The Christensen Fund
Acknowledgements

This conservation planning guide was funded through Grant# 69-3A75-14-261 with generous support from the U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) and The Christensen Fund.

We thank them for their support but acknowledge that the content presented in this planning guide is that of the authors alone and does not necessarily reflect the opinions of these organizations. This planning guide was compiled by Steve Barker, First Nations consultant, Resource Management Systems, LLC and the Arizona Association of the Conservation Districts, with generous feedback by First Nations staff Jackie Francke. We would like to thank the 14R Ranch who received grant support through the “Conservation for Navajo Livestock Producers” project. Their exceptional work and partnership informs the content of this Conservation Planning Guide.

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WHAT IS CONSERVATION PLANNING

Keeping the rangeland healthy and productive is an important part of ranching. As a result, ranchers increase herd health, production, and profitability while protecting the ecosystem and wildlife for future generations, a goal for many ranchers. The development of a conservation plan provides the roadmap for ranchers to accomplish that goal. The plan provides a long term vision and implementation process for ranchers to follow to get each acre of land as healthy and productive as possible and keep it that way.

The goal of a conservation plan is to harvest products from the land in a sustainable and respectful manner. That means managing the soil, water, plant and animal resources to be as healthy and productive as possible on each acre. That means trying to capture every drop of rain right where it falls. It also means taking the necessary actions to address resource problems such as erosion, excess runoff, heavily grazed areas, and excess sediment in the streams.

There are many things to learn as you work to improve the condition of the natural resources on your ranch, but there are two keys to being successful.

1. Engage and learn from other people – from ranchers who know the ecological rhythm, pulse, and capacity of the land and who are committed to keeping it healthy; and from university and agency specialists who are knowledgeable about managing the soil, water, air, plant and animal resources.

2. Develop a plan of action.

DEVELOPING YOUR CONSERVATION PLAN

There are three basic steps to developing a conservation plan.

1. Inventory and assess the condition of your land and evaluate your current management
2. Identify goals, evaluate alternatives, and prioritize what you want to accomplish
3. Put together your plan, with a timeframe for getting it done

There are six important parts of a conservation plan

1. Conservation Plan Inventory Map
2. Conservation Plan Inventory Workbook
3. A Soil and/or Ecological Site Map
4. Vegetation Inventory
5. Conservation Plan Map
6. Conservation Plan and Practice Schedule
To develop a conservation plan, you need to start with an inventory of your ranch. That usually starts with a map of the ranch, showing where all the existing water, fencing, and other range improvements are located. Show the existing pasture numbers and/or names and acres on the map.

**Show Existing Improvements On Your Inventory Map**

Label existing range improvements or use a system of numbering that will connect things shown on the map with information you will put in your inventory workbook. Here is an example for labeling to identify existing improvements on the inventory map.

- W1 - Well number 1
- E1 - Earth dam or pond number 1
- S1 - Storage tank number 1
- T1 - Trough number 1
SHOW RESOURCE PROBLEM AREAS ON YOUR INVENTORY MAP

Show problem areas on the inventory map – erosion problems, noxious weed or shrub invaded areas, areas where grazing is too heavy, and areas where livestock rarely graze, or can’t graze. Label everything and/or use a legend on the map to identify everything. Labeling everything allows the things on the map to be connected to pictures, and information in the inventory workbook and conservation plan practice schedule.

- ER1 - Erosion area 1 (i.e., road erosion, gullies, streambank, wind erosion, sheet and rill erosion)
- NW3 - Area 3 with noxious weeds that need to be controlled
- ST1 - Area 1 with invasive shrubs or trees or cacti that need to be controlled
- HG2 - Heavily grazed area 2
STEP 2: CONSERVATION PLAN INVENTORY WORKBOOK

Develop a Conservation Plan Inventory Workbook that provides information about your ranch, details about the existing improvements, the current condition of the resources, and your current management. The following example can be used as a guideline of what to include in your Inventory Workbook. Adjust it to fit your needs.

CONSERVATION PLAN INVENTORY WORKBOOK

CONTACT INFORMATION

Provide the contact information for all of the land owners, grazing permittees or managers on this ranch.

<table>
<thead>
<tr>
<th>Business Name</th>
<th>Contact Person Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position (Owner, Permittee, Manager, etc.)</td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>State</td>
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<tr>
<td>Business Phone</td>
<td>Home Phone</td>
</tr>
<tr>
<td>Email Address</td>
<td>Cell Phone</td>
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</table>

FIELDS AND PASTURES

The following table provides information about existing and planned fields and pastures on the ranch.

<table>
<thead>
<tr>
<th>Field or Pasture Number</th>
<th>Pasture Name</th>
<th>Existing or Planned</th>
<th>Land Use (range, crop, pasture)</th>
<th>Acres</th>
<th>Land Ownership</th>
</tr>
</thead>
</table>

LIVESTOCK AND GRAZING MANAGEMENT

PERMITTED LIVESTOCK

For lands leased or permits from a State, Tribal, or Federal government, show the permitted animal numbers.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Lease or Permit Expiration Date</th>
<th>Permitted Kind of Animal</th>
<th>Permitted Animal Unit Months (AUMs)</th>
<th>Permitted Number of Animals</th>
<th>Allowed Grazing Period Each Year</th>
</tr>
</thead>
</table>
**Kinds of Livestock**

The following table provides general information about the livestock on the ranch.

<table>
<thead>
<tr>
<th>Herd Number</th>
<th>Animal Kind and Class</th>
<th>Current Number of Animals</th>
<th>Average Number of Animals</th>
<th>Registered Livestock</th>
<th>Average Weights</th>
<th>Yearlong or Typical Dates Grazed</th>
</tr>
</thead>
</table>

**Typical Grazing Rotation**

Shows the typical grazing rotation that has been followed over the last few years.

<table>
<thead>
<tr>
<th>Herd</th>
<th>Pasture</th>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
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<th>Dec</th>
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</thead>
</table>

**Wildlife**

Identifies the kinds of wildlife on the operation and whether the conservation plan will benefit the species or if the species is causing problems for the ranch.

<table>
<thead>
<tr>
<th>Wildlife Species</th>
<th>Desirable</th>
<th>Undesirable</th>
<th>Activities being done or planned to benefit the species</th>
<th>Reasons the species is undesirable</th>
</tr>
</thead>
</table>

**Livestock Water Wells and Surface Water Sources**

The following table provides information about the existing wells, streams springs and other water sources on the ranch.

<table>
<thead>
<tr>
<th>Label on Map</th>
<th>Water Type</th>
<th>Own Water Right</th>
<th>Pasture Where Located</th>
<th>Pastures Served</th>
<th>Flow Rate gpm</th>
<th>Pump Type</th>
<th>Water Quality (Excellent, Good, Fair, Poor)</th>
<th>Water Reliability (Excellent, Good, Fair, Poor)</th>
<th>Water Availability (Yearlong or Seasonal)</th>
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</thead>
</table>

**Ponds and Water Harvesting Catchments**

The following table provides information about the existing ponds and catchments on the ranch.

<table>
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<th>Label on Map</th>
<th>Water Type</th>
<th>Own Water Right</th>
<th>Pasture Where Located</th>
<th>Pastures Served</th>
<th>Size of Watershed or Catchment</th>
<th>Storage Capacity (gal)</th>
<th>Reliability (Excellent, Good, Fair, Poor)</th>
<th>Availability (Yearlong or Seasonal)</th>
</tr>
</thead>
</table>
### Storage Tanks and Troughs

The following table provides information about the existing storage tanks and troughs on the ranch.

<table>
<thead>
<tr>
<th>Storage Number</th>
<th>Type</th>
<th>Water Source</th>
<th>Pastures Served</th>
<th>Storage Capacity</th>
<th>Condition (Excellent, Good, Fair, Poor)</th>
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</thead>
</table>

| **Troughs** |

<table>
<thead>
<tr>
<th>Trough Number</th>
<th>Type</th>
<th>Water Source</th>
<th>Pastures Served</th>
<th>Storage Capacity (gal)</th>
<th>Escape Ramp?</th>
<th>Condition (Excellent, Good, Fair, Poor)</th>
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</thead>
</table>

### Past Land Treatments

The following table provides information about past land treatments such as range seeding, noxious weed control, brush management, etc. that have been done on the ranch.

<table>
<thead>
<tr>
<th>Field or Pasture</th>
<th>Treatment Type</th>
<th>Treatment Acres</th>
<th>Description</th>
<th>Treatment Dates</th>
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</thead>
</table>

### Average Precipitation

The following table provides the average precipitation measured on the ranch.

<table>
<thead>
<tr>
<th>Location</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Total</th>
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</thead>
</table>

### Monitoring

The following monitoring is being done or planned on the ranch.

<table>
<thead>
<tr>
<th>Pasture Number</th>
<th>Key Area Number</th>
<th>Type of Monitoring</th>
<th>Year Established or Planned</th>
<th>Last Year Read</th>
</tr>
</thead>
</table>
OTHER CONSIDERATIONS
Provide information on other considerations needed in designing and implementing the conservation plan. These considerations may include underground utilities, existing easements, cultural resources, federal, state, or tribally listed species, poisonous plant problems, predator problem areas or recreation activities that occur on the ranch, etc.

Include pictures in your inventory workbook. Label the pictures with the same symbols you used on the Inventory Map. If you have internet access, free tools like Google Earth will let you zoom in and print pictures of areas with gullies, road erosion, and other problems. Google Earth includes a scale on the photo that can be used for estimating distances or acres.
STEP 3: SOIL AND ECOLOGICAL SITE MAPS

An ecological site is an area of land that produces various types and amounts of vegetation from other areas. These plant community differences are common because the soils are different across the ranch. There may be deep sandy soils, heavy clay soils, or shallow rocky soils on steep mountain slopes. On larger ranches the plant community changes may also be due to significant differences in annual rainfall from the lower to the higher elevations on the ranch. NRCS ecological site descriptions provide information about the plant communities and plant production on each soil type. Ecological Site Descriptions are available on the internet.

For your Conservation Plan, include a map showing these different soils and ecological sites, along with descriptions of the soils and ecological sites. The NRCS Web Soil Survey is a free internet tool you can use to create a soil and/or ecological site map for your ranch, similar to the one shown here. This tool provides descriptions of the soils. If you do not have internet access or a computer, another option is to go to the local Conservation District, NRCS, BIA, or Cooperative Extension Service Office and ask them if they can provide you with an ecological site map and other maps that would cover your ranch area, along with a paper or electronic copies of the soil descriptions and ecological site descriptions.

If you have a smart phone and cell coverage, there is also a Web Soil Survey phone app that will give you a description of the soils and identify the ecological site you are standing on.

If you can’t get a soil or ecological site map yourself or from one of the recommended contacts, use a tool like Google Earth to outline the areas on your ranch that have different plant communities.
STEP 4: VEGETATION INVENTORY

The next step is to go out and collect information about the current production of the plant communities that are on each of the significant ecological sites on your ranch. If you have never done this, you might want to see if you can get someone from NRCS, BIA, Extension Service or another agency to come out and help you get started. There are many references available at libraries and on the internet that can provide more information about how to do this.

Pick locations that represent a typical plant community for each ecological site on your ranch. Mark the sample locations on the inventory map. Take a picture, then collect information about the kinds of plants that are there, and how many pounds per acre are being produced.

The herbaceous plants can be clipped within in a frame of a known size. A standard frame size for clipping herbaceous plants on rangeland is 9.6 square feet which is 37.18 inches per side for a square plot frame, or you can make a 9.6 square foot hoop by connecting the ends of an 11-foot length of flexible pipe, or wire or cable.
Set out at 10 frames and clip the non-woody plants that are rooted in each frame. Take only the growth you think grew in the last year – usually the green and light straw colored material – not the old gray material. Put the clipped material in a bag, let it dry for a few days if the plants are green, and then weigh it. NOTE: Make sure you subtract the weight of the bag.

Grasses and forb material are normally weighed in grams. You can purchase gram scales to weigh your samples, or you could take your dried samples to the NRCS, BIS, Extension Service office to get them weighed. The total dry weight in grams from the 10 frames (9.6 Sq. Ft.) equals the pounds per acre of production. If you use a different size frame, use more or less than 10 frames, or use a different weight measure then you will need to make adjustments your calculations.

If you know the species, you should measure the production by species. There are many guides available that can help you identify the plant species. If you don’t know the plants, then just group them - perennial grasses (grasses that are present all year), perennial forbs (weeds and wildflowers that are present all year), annual grasses and annual forbs that come up from seed each year.

You also need to inventory any shrubs and trees at each inventory location. For this, it is recommended that you use a 1/100 acre plot (21 ft x 21 ft). You can pace out 7 big steps in each direction or use a tape to lay out your shrub plot.

Write down the average size for each shrub species in the area (height and diameter). Use that size shrub as your “sample unit” size. Then count number “sample units” for each species in the 21 x 21ft shrub plot.
**Example:** Two or three small shrubs might be grouped together to be equal to one of your “sample units”. Or a very large shrub might be equal to 2 or 3 of your “sample units”. Count the number of “sample units” – not shrubs.

Inventory 3 or 4 shrub plots at each sampling location. That information, along with herbaceous production, can be used by BIA, NRCS, and others to get a reasonable estimate current production and composition of the plant communities. Attach to your vegetation inventory data along with the photos to your Inventory Workbook.

There are other assessments you might want to consider doing while you are at each inventory location if you are familiar with them or have agency staff helping you. They include an NRCS Wildlife Habitat Evaluation Guide, a Rangeland Health assessment, and ground cover measurements (bare soil, gravel, rock, litter, vegetation basal cover).
Conservation practices include

- structural range improvements like fences, pipelines, and storage tanks
- vegetation treatments such as seeding, brush management and noxious weed control, and
- management activities such as grazing management and wildlife management

The existing and planned conservation practices work together as a Resource Management System to help manage the soil, water, plants, animals and other natural resources on the ranch.

Develop a Conservation Plan Map as depicted above that shows the existing range improvements (fences, water etc.), then clearly show where the planned structural conservation practices you need will be installed, and where planned vegetative treatment areas like planned brush management areas will be conducted. Use a legend or label everything on the map so that each conservation practice shown on the Conservation Plan Map can be identified in the Conservation Plan Practice Schedule.
**Step 6: Conservation Plan and Practice Schedule**

The Conservation Plan and Practice Schedule identifies the goals and objectives for the Conservation Plan, and the Conservation Practices that will be implemented, including the kind, sizes, and amounts needed, and a schedule for when those practices are planned to be completed. The following pages provide a template you can use to develop your Conservation Plan Practice Schedule.

**Business Name**
Approximate Acres in this Conservation Plan

**Brief Description of the Operation**
This provides a brief description of the farming or ranching operation, including a general description of the land, and the kinds of livestock produced.

**Goals**
These include the broad goals for managing the natural resources on the operation, economic goals for the operation, and goals that identify how my conservation plan will benefit my community.

**Objectives**
These are the specific actions or activities that are planned over the next two to five years that are needed to help achieve the overall goals.

**Planned Conservation Practices**
Use the following section as a template. Remove any conservation practices you do not need, and include similar information about other conservation practices you might need on your ranch. There is a guide to common conservation practices used on rangeland in the Appendix.

**Prescribed Grazing**
Grazing will be managed to control the timing, frequency, duration, intensity, and distribution of livestock use in each pasture to maintain those portions of the rangeland that support the desired plant community, and to help address identified problems on those portions of the rangeland that have erosion problems, excess runoff, water quality problems, plant productivity and/or diversity problems, noxious or invasive species, forage quality and quantity problems, wildlife habitat concerns or other resource concerns.

An initial grazing management plan has been developed that balances the current forage production in each pasture with livestock numbers. The grazing management plan is based on the currently available livestock water in each pasture, and the reliability and distribution of those waters.
EXAMPLE OF A PLANNED GRAZING ROTATION

Year 1
C=cow, H=horse, T=stud, W=weaning calf, Y=yearling heifers

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<th>Pasture</th>
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Year 3

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<td>CHB</td>
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</tbody>
</table>

Flexibility is essential to the grazing management plan to adjust for variability in precipitation, the availability of livestock water, the potential need to adjust for wildfires, poisonous plant concerns, predator issues, and to adjust for vegetative treatments such as brush management. As the conservation plan is implemented, additional pastures, livestock water or other changes may occur that will initiate changes to the initial grazing management plan. Monitoring will be done at the end of the growing season each year. Each year, the monitoring information will be combined with these other considerations to determine if the grazing management plan needs to be adjusted.
PLANNED LIVESTOCK WATER DEVELOPMENTS
Livestock water developments will be installed or repaired to provide reliable livestock water in each pasture or grazing area to support the grazing management plan. These livestock water developments are intended to distribute livestock grazing as evenly as possible. The existing and planned water developments are shown on the Conservation Plan Map. The following table shows the planned components (wells, pumps, pipelines, storage tanks, troughs, etc.) for each planned water project on the ranch.

<table>
<thead>
<tr>
<th>Project No.</th>
<th>Item</th>
<th>Field or Pasture</th>
<th>Planned Year</th>
<th>Planned Type (steel, pvc, etc)</th>
<th>Planned Number</th>
<th>Planned Amounts (length, depth etc)</th>
<th>Planned Capacity (gallons, gpm etc)</th>
</tr>
</thead>
</table>

PLANNED FENCES
Fences will be installed or repaired to help control livestock grazing as part of the grazing management plan. Planned fences are shown on the Conservation Plan Map.

<table>
<thead>
<tr>
<th>Fence No.</th>
<th>Between Fields or Pastures (or on boundary of pasture(s))</th>
<th>Planned Year</th>
<th>New or Replace</th>
<th>Planned Fence Type (barbed wire, electric, woven wire, etc.)</th>
<th>Planned Amount (feet or miles)</th>
</tr>
</thead>
</table>

PLANNED WATER DIVERSIONS FOR ROAD EROSION
Water bars will be installed on sections of dirt road that are eroding to divert runoff water away from the road where it can be done safely without causing new erosion problems. Enter the location number here and show them on the Conservation Plan Map with their associated number.

<table>
<thead>
<tr>
<th>Location No.</th>
<th>Fields or Pastures</th>
<th>Planned Year</th>
<th>Length of Road Section</th>
<th>Average Road Width</th>
<th>Average Slope of Road (%)</th>
<th>Planned Number of Diversions</th>
</tr>
</thead>
</table>
GRADE STABILIZATION STRUCTURES
Grade stabilization structures will be installed to control gully erosion head cuts using structures such as loose rock or rock and brush structures. Enter a location number here and show the location number on the Conservation Plan Map.

<table>
<thead>
<tr>
<th>Location No.</th>
<th>Field or Pasture</th>
<th>Planned Year</th>
<th>Size of gully (average depth, width, length)</th>
<th>Estimated acres that drain into the gully</th>
<th>Kind of structures planned</th>
<th>Number of Structures planned</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

BRUSH MANAGEMENT
Woody species will be killed or removed to restore the natural balance of grasses, forbs, shrubs and trees as described in the ecological site description for the desired plant community phase. The location of the brush management projects are shown on the Conservation Plan Map.

<table>
<thead>
<tr>
<th>Brush Project No.</th>
<th>Fields or Pastures</th>
<th>Planned Year</th>
<th>Target Species</th>
<th>Planned Method of Treatment</th>
<th>Average Plants Per Acre Being Removed</th>
<th>Acres planned for treatment</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

HERBACEOUS WEED CONTROL
Herbaceous noxious or invasive weeds will be treated to restore the natural balance of grasses, forbs, shrubs and trees as described in the ecological site description for the desired plant community phase. The locations of the projects are shown on the Conservation Plan Map.

<table>
<thead>
<tr>
<th>Weed Project No.</th>
<th>Fields or Pastures</th>
<th>Planned Year</th>
<th>Target Species</th>
<th>Planned Method of Treatment</th>
<th>Average Plants Per Acre Being Removed</th>
<th>Planned Amount</th>
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</table>
Appendix A: Some Basic Principles of Range Management

There are a few basic principles of range management that every rancher should know. Understanding these basic principles will go a long way toward helping you developing a good conservation plan that will accomplish your goals and objectives.

Principle Number 1: It All Starts With Photosynthesis

All of us learned in high school that plants make their own food in a process called photosynthesis. Using sunlight energy, the chlorophyll in the plant’s green leaves converts carbon dioxide from the air and water from the soil into a simple sugar (glucose).

Glucose - the simple sugar made in the green leaves using the energy of the sun is the food plants need to grow.

The first principle of range management is to understand that when grazing animals remove green leaves, they are removing the food producing parts of the plant. If grazing animals are allowed to continuously remove most of the leaves, the plants will not be able make enough food and they will die.

So what about nitrogen, phosphorus, and other nutrients in the soil that we know the plants use? Plants combine the glucose they make during photosynthesis with these nutrients from the soil to make important compounds such as starch, protein, fats, lignin, and enzymes that are important for plant growth. These compounds become a source of food for animals and humans.

The important thing to remember is that plants must make the glucose in their green leaves before the nutrients in the soil can be used to make these other compounds. If you don’t believe that photosynthesis provides the source of food for a plant… take a healthy potted plant, with plenty of moisture and nutrients in the soil, and put it in a dark closet. After a few days, it will die of starvation. Nutrients in the soil are only useful to plants that are making their own food using water, air, and sunlight.

To maximize plant health and production on your grazing lands, you need to come up with a grazing management strategy that will maximize the amount of green leaves that your plants produce during the growing seasons. When you hear ranchers say they grow grass - not cows, you know they have an understanding of the first principle of grazing management. Ranchers use cows to harvest their real crop - grass.
**Principle Number 2: Capture the Rain Right Where It Falls**

To maximize production on each acre of your ranch, you also need to capture every possible drop of rain and snow, and get it to infiltrate in the soil right where it falls. If every acre is capturing every possible drop of precipitation, then every acre will produce the maximum possible amount of vegetation. That means every acre must always be ready to capture the next big storm.

There are several things that affect how much precipitation can be captured. But the basic concept is to use vegetation and plant litter to create barriers on the surface of the soil that will hold the precipitation where it falls long enough for the water to infiltrate into the soil. Once the water starts running off from where it landed, and starts collecting in flow channels, anything that cannot infiltrate into the channels will be lost. Vegetation and litter cover also reduces evaporation loss.

How fast water will infiltrate into the soil depends mostly on the texture of the soil surface. Texture describes the sizes of the soil particles. There are three sizes of soil particles – sand, silt, and clay. Sand is the largest soil particle. Silt is the next smallest soil particle and clay is the smallest soil particle. Usually the soil has a mixture of sand, silt and clay particle sizes, which is called a loam. If there is more sand, it is called a sandy loam, more clay – clay loam etc.

Because of their large particle sizes, sands soils have relatively large pore spaces between the sand particles. Those big pore spaces allow rain to infiltrate into sandy soils pretty rapidly. Generally speaking, soils that have a sandier textured surface are the easiest to manage and they tend to be more productive, because they can capture most or all of the precipitation they receive.

Clay particles are extremely small, and they tend to be somewhat flat. So they fit together very tightly like a shingled roof. The pore spaces are extremely small, so it takes much longer for water to infiltrate into clay soils. To capture the maximum amount of precipitation on clay soils, you have to maximize the vegetation and litter cover. The organic matter from decaying plant parts can also help bind small clay particles together into larger particles – creating bigger pore spaces.

This is where a soil map of your ranch is important. The soil descriptions will tell you about the soil textures on your ranch, and that will tell you which areas will capture precipitation the easiest, and which areas will be more difficult. Then you can make better decisions about where you need to leave the most vegetative cover. It should probably influence where you locate your livestock waters as well.

Once you start working on capturing rainfall, everything that helps water run off of your ranch will become your enemy - bare soils, roads, culverts, gullies, washes... anything that helps water start flowing. Once the water starts flowing into those drainages and washes, most of that water is gone – it has left the ranch. You have to try to capture it where it falls.

Oh, and just a warning, once you start capturing rain, you won’t have as much runoff to fill those dirt tanks anymore. You may need to plan to use wells, springs, or catchments with storage tanks, pipelines and troughs to provide reliable livestock water.

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**Principle Number 3: Prevent Soil Erosion**

Another reason to capture every drop of rainfall where it lands is to prevent soil erosion. When you see soil erosion, it means either your rainfall is running off. You do not have enough plant cover to
protect the soil from water or wind erosion, or both. Again, good healthy plant and litter cover with good healthy root systems is the key.

When water infiltrates into the soil surface, the water dissolves some of the minerals in the soil surface, and it picks very small soil particles (mostly clay), and carries the minerals and soil particles down deeper into the soil. Over very long periods of time, those minerals and clay particles get deposited as layers (horizons) in the soil profile. Minerals and clay particles at the soil surface will also get carried away in runoff water.

As the clay is removed from of the soil surface, the very top of the soil surface may become a little sandier – which helps that soil capture rainfall. Sometimes just an inch of sandier textured surface can make a huge difference in the plant production. That sandy surface just a couple inches thick can help capture that rain storm. You don’t want to lose that soil surface.

With soil erosion, you not only lose the sandier surface but you can also lose the organic matter which holds nutrients, and helps water infiltrate into the soil and helps the soil hold more moisture. If you lose enough soil, you may expose the horizons deeper in the soil where all of the clay and/or minerals accumulated. When the clay and mineral horizon are closer to the surface, they limit the available water holding capacity of the soil, and the rooting depth of your plants. The areas where these clay and mineral horizons have been exposed by erosion are some of the most difficult areas to reestablish any vegetation.

Wind and water erosion also carries away your seeds, and the plant litter cover you need to help you capture rainfall. That litter contains nutrients that were carried up from the deep root systems into the leaves, which were then deposited on the soil surface. Prevent soil erosion. It is important.

**PRINCIPLE NUMBER 4: GROW DEEP ROOTS**

It only makes sense to manage for the deepest possible root systems. Plants that have access to deeper soil moisture will not only produce more forage, but the plants will stay green longer – extending the growing season. That increases overall forage quality and quantity. Deeper roots allow the plant to access nutrients from deeper down in the soil. That improves the quantity and quality of forage available for your livestock. Deeper root systems also help your forage plants survive dry periods and droughts.

What you might not know is that plants need to continuously grow new roots during the growing season. The green leaves above ground provide the food needed to grow new roots below ground. The more leaves produced during the growing season, the deeper and denser the root systems will be. Obviously capturing as much rain as possible
is part of this strategy too. Maximizing leaf and root production during the growing season, and capturing rain where it falls are core principles of managing grazing lands.

**PRINCIPLE NUMBER 5: DORMANT SEASONS ARE FOR HARVESTING**

Photosynthesis only happens in green leaves. In the winter and during dry periods when plants go dormant, the perennial plants live off carbohydrates (mostly starch) stored in roots, crowns, stems and other storage structures like bulbs and tubers. Harvesting the dormant leaves has no real effect on the plants.

But remember, those dead leaves fall on the ground as litter, and they are extremely important for creating barriers to capture precipitation. Dormant season grazing management is focused on harvesting the crop of leaves you grew, while maintaining enough plant and litter cover to capture the next storm on each acre.

**PRINCIPLE NUMBER 6: PLANT SEEDS EVERY YEAR**

It is important to manage your grazing so that your desirable plants put out a seed crop in every pasture at least every other year. With continuous grazing, the seeds of the desirable species are regularly consumed by livestock, because they are the most nutritious part of the plant. While some of the seeds from the forage species may pass through the digestive system of grazing animals and still be viable, the amount of desirable seed is reduced.

It is also important to allow seedlings a chance to get established before they are grazed as often as possible.

There are thousands of plants species on our rangelands. Each of them evolved different adaptations that help them to compete with the other plant species for water and space. Some produce new plants from seed, and some can produce new plants vegetatively – using stolons, rhizomes, or bulbs.

Sod grasses are better adapted to heavy grazing pressure than tall bunchgrasses. Sodgrasses will increase on a continuously grazed site where the bunchgrasses do not have enough opportunities to put out seed. The sodgrasses can spread across the site using stolons and underground rhizomes, instead of needing to produce seed.
PRINCIPLE NUMBER 7: UNDERSTAND HOW GRAZING AFFECTS THE PLANT COMMUNITIES

Grazing management systems are designed to control the:

- Timing (time of year the pasture is grazed)
- Duration (how long the pasture is grazed)
- Intensity (how much forage is removed)
- Frequency (how often the pasture get re-grazed)
- Distribution (how the grazing use is distributed)

Plants that are never grazed – the undesirable species - are able to put out lots of green leaves and produce all the food they need. They can grow good deep root systems, and produce plenty of seed. They will stay healthy, and grow and reproduce vigorously.

When grazing animals remove green leaves from the desirable forage species during the growing season, those species cannot produce as much food, so they have shallower root systems, and some or all of the seed crop will be consumed by the grazing animals.

Over time the undesirable plants simply out-compete the grazed plants for water and nutrients. And when space opens up for a new plant to germinate, the seeds from the undesirable plants significantly outnumber the seeds from the desirable plants. That is how grazing can change a plant community. You simply need a reasonable grazing rotation that allows the desirable species to put out a crop of seed on a regular basis.

Let’s look at how a simple three pasture deferred grazing rotation system accomplishes this.

<table>
<thead>
<tr>
<th>Spring</th>
<th>Early Summer</th>
<th>Late Summer -Fall</th>
<th>Winter (Dormant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>Mar</td>
<td>Apr</td>
<td>May</td>
</tr>
<tr>
<td>1</td>
<td>Graze Pasture 1</td>
<td>Graze Pasture 2</td>
<td>Graze Pasture 3</td>
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<tr>
<td>2</td>
<td>Graze Pasture 2</td>
<td>Graze Pasture 3</td>
<td>Graze Pasture 1</td>
</tr>
<tr>
<td>3</td>
<td>Graze Pasture 3</td>
<td>Graze Pasture 1</td>
<td>Graze Pasture 2</td>
</tr>
<tr>
<td>4</td>
<td>Start Over at Year 1</td>
<td></td>
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</tbody>
</table>

In this example of a simple 3 pasture rotation, every pasture gets grazed during the spring growing season one year, and then it gets rested during the spring growing season for the next 2 years in a row. Every pasture gets grazed in the late summer growing season one year, and then rested during the late summer growing season for the next 2 years in a row.

During those 2-year periods of spring and summer growing season deferment, all of the preferred forage plants get to put out as many leaves as they want, build good deep root systems, and put out seeds. They are providing good cover to capture rainfall where it falls.

If you do not want to move that often, (or you are in a lower rainfall area that needs longer rest times between grazing), a three pasture rest rotation may work better for you. In a rest rotation grazing
system, each pasture gets grazed for 6 months, and then rested for a full year. During the 3 year rotation, each pasture gets grazed once during the growing season, and once during the dormant season. The rest of the time, the desirable forage plants are growing leaves, putting out seed, covering the soil and competing for space. Because the grazing periods are longer, the preferred areas of the pasture will be grazed heavier using this system. But the pasture gets back to back spring and summer rest two out of three years.

Note: For any examples, you should adjust the months in your grazing plan to fit your growing seasons.

<table>
<thead>
<tr>
<th>Year</th>
<th>Spring</th>
<th>Summer</th>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr</td>
<td>May</td>
<td>Jun</td>
<td>Jul</td>
</tr>
<tr>
<td>1</td>
<td>Graze Pasture 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Graze Pasture 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Graze Pasture 2</td>
<td></td>
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<td></td>
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<tr>
<td>4</td>
<td>Start Over at Year 1</td>
<td></td>
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</tr>
</tbody>
</table>

**Principle Number 8: Disturbances Create Changes In Plant Communities**

If the available soil moisture is being fully utilized by a healthy stand of perennial plants, then only a significant disturbance will cause that plant community to change. It is important to understand that grazing management is not going to cause a juniper thicket into a grassland. Many of the undesirable plants that have increased on our rangelands are very long lived. And they are fully utilizing any soil moisture that gets into the soil. A fully occupied perennial plant community is pretty stable, and hard to change.

Fire and drought are the two primary natural disturbances that can open up the plant community to change. In many cases, our conservation plans are designed to set everything up so that if a fire or drought opens up the plant community, our desirable species have a chance to occupy the space that is created.

We can also introduce disturbances as part of the conservation plan, using prescribed fire and mechanical or
chemical brush control, to force the plant community to open up. The key is to not create any disturbance until you know that there is a reasonably good chance that the disturbance will cause a desirable change.

For example, consider that juniper thicket again. If the only species that has been growing in that thicket for the last 30 years is juniper, then most of the seed available on the ground that can respond to a disturbance is… juniper seed. So, after you spend thousands of dollars to remove all of the juniper trees, there is a reasonably good chance that you will just get a new stand of juniper.

The better plan might be thin the juniper first, to open up some space, and apply some good grazing management for a few years to let some perennial grasses establish in those openings. Then, after you have built up a seed bank of perennial grass species for a few years, you could treat the rest of the juniper, - maybe even using regular prescribed burning, with a reasonably good chance to increase and maintain the perennial grasses on the site.
**Appendix B: Some Common Conservation Practices for Solving Conservation Problems**

**Resource Problem: Soil Erosion - Sheet, Rill, & Wind Erosion**

Detachment and transportation of soil particles caused by rainfall runoff/splash, irrigation runoff or wind that degrades soil quality

**Common Conservation Practices Used**

**614 Watering Facility**

Provide well distributed, reliable water to facilitate Prescribed Grazing to maintain or improve the plant productivity on the ecological site to protect the soil from wind and water erosion.

**642 Water Well**

Install a well to provide livestock water to facilitate Prescribed Grazing to maintain or improve the plant productivity on the ecological site to protect the soil from wind and water erosion.

**460 Land Clearing**

This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas as part of installing another conservation practices or to achieve a conservation objective.

**548 Grazing Land Mechanical Treatment**

Use mechanical treatments such as pitting, contour furrowing, and ripping to improve the capture and infiltration of precipitation and increase plant productivity and vigor to protect the soil from erosion.

**382 Fence**

This may be needed as a facilitating practice to apply Prescribed Grazing.

**528 Prescribed Grazing**

Manage the frequency, timing, duration, and intensity of grazing to maintain a healthy and productive plant community and litter cover to protect the soil from erosion.

**338 Prescribed Burning**

Use controlled fire to restore the quality and productivity of vegetation to protect the soil from erosion.

**516 Pipeline**

This may be needed as a facilitating practice to distribute water for applying Prescribed Grazing.
Access Control
Control livestock and vehicle access following treatments such as brush management and range planting to obtain maximum benefits.

Range Planting
Reestablish native species to restore the plant productivity on the ecological site to protect the soil from wind and water erosion.

Brush Management
Control invasive woody vegetation to allow increased production, vigor and quality of grasses and forbs to protect the soil from erosion.

Critical Area Planting
Establish vegetation on highly erosive soils or construction areas to increase vegetation cover and protect the

RESOURCE PROBLEM: SOIL EROSION - CONCENTRATED FLOW EROSION
Untreated classic gullies may enlarge progressively by head cutting and/or lateral widening. Ephemeral gullies occur in the same flow area and are obscured by tillage. This includes concentrated flow erosion caused by runoff from rainfall, snowmelt or irrigation water.

COMMON CONSERVATION PRACTICES USED
Brush Management
Control invasive woody vegetation to allow increased production, vigor and quality of grasses and forbs to protect the soil from erosion.

Lined Waterway or Outlet
Install a waterway or outlet having an erosion resistant lining of concrete, stone, synthetic fabric or other permanent material to stabilize existing or future roadway caused erosion.

Land Clearing
This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas as part of installing another conservation practices or to achieve a conservation objective.

Grade Stabilization Structure
Install structures in flow channels that stabilize grades to prevent head cutting or the advance of gullies into your cropland.

Lined Waterway or Outlet
Install a waterway or outlet having an erosion resistant lining of concrete, stone, synthetic fabric or other permanent material to stabilize existing or future roadway caused erosion.

Animal Trails and Walkways
Establishing trails or travel ways that divert livestock away from erosion prone areas.
382  Fence
This may be needed as a facilitating practice to apply Prescribed Grazing.

410  Grade Stabilization Structure
Build structures made of rock, soil, timber, woven wire, etc. to stabilize grades, control runoff and prevent the formation or advance of gullies.

560  Access Road
Renovate an existing road to provide proper alignment and runoff control measures to prevent concentrated flow erosion.

548  Grazing Land Mechanical Treatment
Use mechanical treatments such as pitting, contour furrowing, and ripping to improve the capture and infiltration of precipitation and increase plant productivity and vigor to protect the soil from erosion.

528  Prescribed Grazing
Manage the frequency, timing, duration, and intensity of grazing to maintain a healthy and productive plant

550  Range Planting
Reestablish native species to restore the plant productivity on the ecological site to protect the soil from erosion.

342  Critical Area Planting
Establish vegetation on highly erosive soils or construction areas to increase vegetation cover and protect the soil from wind and water erosion.

362  Diversion
Build water bars on roads to divert water and prevent concentrated flow erosion.

338  Prescribed Burning
Use controlled fire to restore the quality and productivity of vegetation to protect the soil from erosion.

640  Waterspreading
Divert runoff with a system of dams and dikes and spreading it over relatively flat areas to prevent concentrated flow erosion.

472  Access Control
Control livestock and vehicle access to treated areas during the growing season for at least two years following treatments such as brush management and range planting to obtain maximum benefits. Longer periods of Access Control may be needed if precipitation is below normal.
RESOURCES PROBLEM: SOIL EROSION - EXCESSIVE BANK EROSION FROM STREAMS SHORELINES OR WATER CONVEYANCE CHANNELS

Sediment from banks or shorelines threatens to degrade water quality and limit use for intended purposes.

COMMON CONSERVATION PRACTICES USED

584 Channel Bed Stabilization
Stabilize the channel of a stream with suitable structures to control aggradation or degradation in a stream.

580 Streambank and Shoreline Protection
Provide erosion protection to streambanks and shorelines using structural and/or vegetative measures.

460 Land Clearing
This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas as part of installing another conservation practices or to achieve a conservation objective.

326 Clearing and Snagging
Remove vegetation, snags, and other debris to restore flow capacity in stream channels and prevent bank erosion by eddies or redirection of flow.

RESOURCES PROBLEM: EXCESS WATER - PONDING, FLOODING, SEASONAL HIGH WATER TABLE, SEEPS, AND DRIFTED SNOW

Surface water or poor subsurface drainage restricts land use and management goals. Wind-blow snow accumulates around and over surface structures, restricting access to humans and animals.

COMMON CONSERVATION PRACTICES USED

382 Fence
Install snow fences to reduce wind-blow snow accumulations.

460 Land Clearing
This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas as part of installing another conservation practices or to achieve a conservation objective.

528 Prescribed Grazing
Manage the livestock grazing to maintain a uniform cover of herbaceous vegetative and litter. This will help capture and infiltrate rainfall more uniformly, and minimize rapid runoff after storm events.
RESOURCE PROBLEM: INSUFFICIENT WATER - INEFFICIENT MOISTURE MANAGEMENT

Natural precipitation is not optimally managed to support desired land use goals or ecological processes.

COMMON CONSERVATION PRACTICES USED

528  Prescribed Grazing

Manage the frequency, timing, duration, and intensity of grazing to maintain a healthy and productive plant community and litter cover help capture rain where it falls, and hold it until it can infiltrate into the soil. This will help capture and infiltrate rainfall more uniformly, and minimize losses from evaporation and runoff.

472  Access Control

Control livestock and vehicle access to treated areas during the growing season for at least two years following treatments such as brush management and range planting to obtain maximum benefits. Longer periods of Access Control may be needed if precipitation is below normal.

548  Grazing Land Mechanical Treatment

Use mechanical treatments such as pitting, contour furrowing, and ripping to improve the capture and infiltration of precipitation and increase plant productivity and vigor to protect the soil from erosion.

642  Water Well

Install a well to provide livestock water to facilitate Prescribed Grazing.

550  Range Planting

Plant grasses and forbs to restore the cover of herbaceous vegetative and litter. This will help improve the capture and infiltration of precipitation and increase plant productivity and vigor to protect the soil from erosion.

614  Watering Facility

Provide well distributed, reliable water to facilitate Prescribed Grazing.

382  Fence

This may be needed as a facilitating practice to apply Prescribed Grazing.

338  Prescribed Burning

Use prescribed burning to restore the cover of herbaceous vegetative and litter. This will help capture and infiltrate rainfall more uniformly, and minimize losses from evaporation and runoff.

314  Brush Management

Use chemical or mechanical methods to control woody vegetation and restore a more uniform cover of herbaceous vegetative and litter. This will help capture and infiltrate rainfall more uniformly, and minimize losses from evaporation and runoff.
Pipeline

This may be needed as a facilitating practice to distribute water for applying Prescribed Grazing.

**Resource Problem: Water Quality Degradation - Excess Nutrients in Surface and Ground Waters**

Nutrients (organics and inorganics) are transported to receiving waters through surface runoff and/or leaching into shallow ground waters in quantities that degrade water quality and limit use for intended purposes.

**Common Conservation Practices Used**

351 Water Well Decommissioning

Permanently close and seal off a water well that is no longer in use. Prevent the chance for nutrients or organics to contact the water table.

528 Prescribed Grazing

Manage the location, timing and intensity of livestock grazing to maintain adequate vegetative cover to reduce runoff and protect water quality. Manage grazing near surface water to maintain water quality.

**Resource Problem: Water Quality Degradation - Petroleum, Heavy Metals and Other Pollutants Transported to Receiving Water Sources**

Heavy metals, petroleum and other pollutants are transported to receiving water sources in quantities that degrade water quality and limit use for intended purposes.

**Common Conservation Practices Used**

309 Agrichemical Handling Facility

Install a facility with an impervious surface to provide an environmentally safe area for the handling of on-farm agrichemicals.

**Resource Problem: Water Quality Degradation - Excessive Sediment in Surface Waters**

Off-site transport of sediment from sheet, rill, gully, and wind erosion into surface water that threatens to degrade surface water quality and limit use for intended purposes.

**Common Conservation Practices Used**

640 Waterspreading

Divert or collect runoff with a system of dams and dikes and spreading it over relatively flat areas.
vegetated areas to reduce erosion and sedimentation in water bodies of concern.

391 Riparian Forest Buffer
Establish riparian trees and/or shrubs adjacent to and up slope from watercourses or water bodies to provide protection within the floodplain.

528 Prescribed Grazing
Manage the location, timing, duration and intensity of livestock grazing to meet the growth requirements of the forage species to maintain their health and vigor and retain adequate vegetative cover to protect the soil surface from erosion.

390 Riparian Herbaceous Cover
Establish grasses, sedges, rushes, ferns, legumes, and forbs tolerant of intermittent flooding or saturated soils in the transitional zone between upland and aquatic habitats to reduce sediment in water bodies of concern.

548 Grazing Land Mechanical Treatment
Use mechanical treatments such as pitting, contour furrowing, and ripping to improve the capture and infiltration of precipitation and increase plant productivity and vigor to protect the soil from erosion.

642 Water Well
Install a well to provide livestock water away from water bodies of concern.

460 Land Clearing
This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas.

561 Heavy Use Area Protection
Stabilize areas frequently and intensively used by people, animals or vehicles by establishing vegetative cover, surfacing with suitable materials, and/or installing needed structures

574 Spring Development
Pipe livestock water away from springs or seeps to minimize or eliminate livestock activity around the spring that is creating excess sediment in the surface water.

342 Critical Area Planting
Planting vegetation on critical sites (highly erosive soils, etc.) in order to increase vegetation cover and improve soil surface stability on areas that contribute runoff and sediment to water bodies of concern.

382 Fence
Use this as a facilitating practice to apply Prescribed Grazing and Access Control.

570 Stormwater Runoff Control
Control stormwater runoff to minimize erosion and sedimentation during and following construction activities, reduce the quantity of stormwater leaving developing or developed sites and improve the quality of stormwater leaving developing or developed sites.
614  Watering Facility
Install troughs to provide livestock water away from streams to minimize or eliminate livestock activity that is creating excess sediment in the surface water.

472  Access Control
Control livestock and vehicle access to highly erodible soil areas that contribute runoff and sediment to water bodies of concern.

638  Water and Sediment Control Basin
Construct an earth embankment to form a sediment trap and water detention basin to trap sediment and improve downstream water quality.

516  Pipeline
This facilitating practice may be needed to distribute livestock water away from water bodies of concern.

**RESOURCE PROBLEM: WATER QUALITY DEGRADATION - ELEVATED WATER TEMPERATURE**

- **Surface water temperatures exceed State/Federal standards and/or limit use for intended purposes**

399  Fishpond Management
Manage impounded water to improve water temperatures for the production of fish or other aquatic

391  Riparian Forest Buffer
Develop a forest of trees to shade the surface of the water to reduce water temperature.

395  Stream Habitat Improvement and Management
Restore physical and biological functions of a stream including riffles and pools that improve water temperatures to provide suitable habitat for desired fish and other aquatic species.

**RESOURCE PROBLEM: DEGRADED PLANT CONDITION - UNDESIRABLE PLANT PRODUCTIVITY AND HEALTH**

- **Plant productivity, vigor and/or quality do not negatively impact other resources or meet yield potential due to improper fertility, management or plants not adapted to site.**

**COMMON CONSERVATION PRACTICES USED**

550  Range Planting
Plant native species to restore the structure and composition of the plant community on the ecological site.
Prescribed Grazing

Manage the frequency, intensity, duration, and timing of livestock grazing to maintain the health of desirable forage species and allow them to put out a seed crop regularly. Rotate the season of grazing in each pasture to help maintain a diversity of vegetation.

Fence

This may be needed as a facilitating practice to apply other conservation practices.

Grazing Land Mechanical Treatment

Use mechanical treatments such as pitting, contour furrowing, and ripping to improve the capture and infiltration of precipitation and increase plant productivity and vigor.

Access Control

Control livestock and vehicle access to treated areas to help ensure successful treatments. This practice is also a facilitating practice to long term management activities such as Prescribed Grazing and Upland Wildlife Habitat Management.

Land Clearing

This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas as part of installing another conservation practices or to achieve a conservation objective.

Brush Management

Use chemical or mechanical methods to control woody vegetation and restore the desired plant community structure and composition on the ecological site.

Prescribed Burning

Use controlled fire to restore the natural balance of trees, shrubs, grasses and forbs on the ecological site.

Resource Problem: Degraded Plant Condition - Inadequate Structure and Composition

Plant communities have insufficient composition and structure to achieve ecological functions and management objectives. As an example, this concern addresses loss or degradation of wetland habitat, targeted ecosystems, or unique plant communities.

Common Conservation Practices Used

Herbaceous Weed Control

Control noxious weeds and other invasive herbaceous vegetation to help restore the plant community structure and composition on the ecological site.

Brush Management

Use chemical or mechanical methods to control woody vegetation and help restore the desired plant community structure and composition on the ecological site.
Prescribed Burning
Use controlled fire to help restore the natural balance of trees, shrubs, grasses and forbs on the ecological

Access Control
Control livestock and vehicle access to treated areas during the growing season following treatments such as brush management to obtain maximum benefits.

Prescribed Grazing
Manage the frequency, intensity, duration, and timing of livestock grazing to maintain cover for wildlife during critical nesting and fawning periods. Rotate the season of grazing in each pasture to help maintain a diversity of vegetation species for cover.

Range Planting
Establish native species to help restore the structure and composition of the plant community on the

Brush Management
Use chemical or mechanical methods to control woody vegetation and restore the desired plant community structure and composition on the ecological site.

Fence
This may be needed as a facilitating practice to apply Prescribed Grazing.

Watering Facility
Provide well distributed, reliable water to facilitate Prescribed Grazing.

Water Well
Install a well to provide livestock water to facilitate Prescribed Grazing.

Pipeline
This may be needed as a facilitating practice to distribute water for applying Prescribed Grazing.

RESOURCE PROBLEM: DEGRADED PLANT CONDITION - EXCESSIVE PLANT PEST PRESSURE
Excessive pest damage to plants including that from undesired plants, diseases, animals, soil born pathogens, and nematodes. As an example, this concern addresses invasive plant, animal and insect species

COMMON CONSERVATION PRACTICES USED
Herbaceous Weed Control
Control noxious weeds and other invasive herbaceous vegetation to restore the desired plant community structure and composition.
RESOURCE PROBLEM: DEGRADED PLANT CONDITION - WILDFIRE HAZARD, EXCESSIVE BIOMASS ACCUMULATION

The kinds and amounts of fuel loadings (plant biomass) create wildfire hazards that pose risks to human safety, structures, plants, animals, and air resources.

COMMON CONSERVATION PRACTICES USED

432  Dry Hydrant
Install a permanent pipe assembly into a pond or other water source to provide all weather access to an available water source for fire suppression.

394  Firebreak
Install a permanent strip of bare ground or low herbaceous vegetation to retard fire on forest, range, and headquarter areas. Install a temporary firebreak to control prescribed burns.

338  Prescribed Burning
Use prescribed burning to reduce fuel loads under controlled conditions and prevent catastrophic wildfire.

314  Brush Management
Reduce shrub density to reduce fuel loads and wildfire hazards on rangelands where there are wildfire hazards for human safety and structures.

RESOURCE PROBLEM: INADEQUATE HABITAT FOR FISH AND WILDLIFE - HABITAT DEGRADATION

Quantity, quality or connectivity of food, cover, space, shelter and/or water is inadequate to meet requirements of identified fish, wildlife or invertebrate species.

COMMON CONSERVATION PRACTICES USED

644  Wetland Wildlife Habitat Management
Manage wetland habitats and connectivity within the landscape for wildlife by manipulating vegetation or timing agricultural activities that enable movement and allow wildlife life cycle activities to complete.

314  Brush Management
Use chemical or mechanical methods to control woody vegetation and restore the desired plant community structure and composition on the ecological site.

460  Land Clearing
This facilitating practice can be used to remove trees, stumps, and other vegetation on wooded areas as part of installing another conservation practices or to achieve a conservation objective.
500  Obstruction Removal
Remove and dispose of trash and other unwanted obstructions in order to reduce wildlife hazards and habitat fragmentation.

516  Pipeline
This practice may be needed to distribute reliable water for wildlife and to facilitate practices such as Prescribed Grazing.

657  Wetland Restoration
Restore a former or degraded wetland site to a close approximation of its original condition for wildlife.

338  Prescribed Burning
Use controlled fire to restore the natural balance of trees, shrubs, grasses and forbs on the ecological site.

636  Water Harvesting Catchment
Capture precipitation runoff from a natural or artificial impermeable surface and convey it to a storage facility to provide water for wildlife. This may also be needed as a facilitating practice to improve the management of livestock grazing near streams and other critical wildlife habitat.

472  Access Control
Temporarily or permanently exclude animals, people, vehicles, and/or equipment from an area to provide habitat needs for wildlife. Control livestock and vehicle access to treated areas following treatments such as brush management and vegetation planting to help ensure success. Control access to critical wildlife areas during nesting, fawning, and spawning periods.

642  Water Well
Install a well to provide livestock water to provide water for wildlife or as a facilitating practice to improve the management of livestock grazing near streams and other critical wildlife habitat.

614  Watering Facility
Modify existing watering facilities to remove barriers across the water surface, install wildlife escape ramps, and prevent degradation of water quality. Install watering facilities to provide an adequate amount and quality of drinking water for wildlife. This may also be needed as a facilitating practice to improve the management of livestock grazing near streams and other critical wildlife habitat.

378  Pond
Install a water impoundment made by constructing an embankment or by excavating a pit or dugout to provide water for wildlife.

734  Fish & Wildlife Structure
Install a structure designed specifically for wildlife to meet wildlife life cycle needs such as loafing, escape, nesting, rearing, roosting, perching, or basking.
Prescribed Grazing

Manage the frequency, intensity, duration, and timing of livestock grazing to maintain cover for wildlife during critical nesting and fawning periods. Rotate the season of grazing in each pasture to help maintain a diversity of vegetation cover across the landscape.

Critical Area Planting

Establishing permanent vegetation on sites that have, or are expected to have, high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation.

Herbaceous Weed Control

Control noxious weeds and other invasive herbaceous vegetation on non-cropped areas to restore the plant community structure and composition and improve wildlife cover or shelter.

Wetland Enhancement

Augment wetland functions beyond the original natural conditions for additional wetland function, habitat, diversity, and capacity.

Riparian Forest Buffer

Establish trees and/or shrubs in the transitional zone between upland and aquatic habitats to provide cover for wildlife, shade and stabilize streambanks.

Riparian Herbaceous Cover

Establish grasses, sedges, rushes, ferns, legumes, and forbs tolerant of intermittent flooding or saturated soils, and manage as the dominant vegetation in the transitional zone between upland and aquatic habitats.

Shallow Water Development and Management

Inundate land to provide water and habitat for wildlife by installing dikes, excavating, ditching, and flooding.

Stream Habitat Improvement and Management

Maintain, improve or restore physical, chemical and biological functions of a stream to meet the life history requirements of desired aquatic species.

Upland Wildlife Habitat Management

Manage upland habitats and connectivity within the landscape for wildlife by establishing or manipulating vegetation to provide species with sufficient space and resources to complete life cycle activities. Plant food plots or leave un-harvested crops for wildlife on cropland.

Wetland Creation

Create a wetland for wildlife on a site location that was historically non-wetland.

Fence

Modify existing fences to improve wildlife movement or to improve wildlife visibility. This practice may also be needed as a facilitating practice to control livestock, vehicles, or equipment in conjunction with vegetative treatments and other conservation practices.
RESOURCE PROBLEM: LIVESTOCK PRODUCTION LIMITATION - INADEQUATE FEED AND FORAGE

Feed and forage quality or quantity is inadequate for nutritional needs and production goals of the kinds and classes of livestock

COMMON CONSERVATION PRACTICES USED

315  Herbaceous Weed Control
Control noxious weeds and other invasive herbaceous vegetation to restore the production of desirable forage species.

550  Range Planting
Reestablish native species to restore the plant productivity on the ecological site.

645  Upland Wildlife Habitat Management
Manage upland habitats and connectivity within the landscape to help balance livestock and wildlife forage needs by manipulating vegetation to change wildlife use areas.

548  Grazing Land Mechanical Treatment
Use mechanical treatments such as pitting, contour furrowing, and ripping to improve the capture and infiltration of precipitation and increase plant productivity and vigor.

528  Prescribed Grazing
Manage the timing, duration, intensity and frequency of livestock grazing to provide desirable forage species periods of rest to restore production, vigor, allow seed production and establishment, and restore preferred forage species on the site.

314  Brush Management
Control invasive woody vegetation to allow increased production, vigor and quality of grasses and forbs.

472  Access Control
Control livestock and vehicle access to treated areas such as brush management and range planting to obtain maximum benefits.

338  Prescribed Burning
Use controlled fire to restore the quality and productivity of desirable rangeland vegetation.

RESOURCE PROBLEM: LIVESTOCK PRODUCTION LIMITATION - INADEQUATE LIVESTOCK SHELTER

Livestock lack adequate shelter from climatic conditions to maintain health or production goals

COMMON CONSERVATION PRACTICES USED
612  Tree/Shrub Establishment
Install trees or large shrubs to provide shade and shelter for livestock.

RESOURCE PROBLEM: LIVESTOCK PRODUCTION LIMITATION - INADEQUATE LIVESTOCK WATER
Quantity, quality and/or distribution of drinking water are insufficient to maintain health or production goals for the kinds and classes of livestock

COMMON CONSERVATION PRACTICES USED

642  Water Well
Drill a livestock well to provide water for livestock use.

636  Water Harvesting Catchment
Capture precipitation runoff from a natural or artificial impermeable surface and convey it to a storage facility to provide water for livestock.

574  Spring Development
Collecting water from springs or seeps to provide or improve the quantity and/or quality of water for Livestock.

533  Pumping Plant
Install a pumping facility to deliver water for livestock use. Examples are submersible pumps powered by electricity, generators or solar panels, pump jacks and windmills.

614  Watering Facility
Install troughs and storage tanks to provide reliable high quality water for livestock.

521A  Pond Sealing or Lining, Flexible Membrane
Install a sealant or liner in the bottom of your ponds to reduce seepage loss.

378  Pond
Construct a pond as a water source for livestock by excavating soil or creating an earthen embankment to capture runoff water.

516  Pipeline
Install pipelines to distribute water from a source (well, storage tank, etc.) to watering facilities or ponds.

RESOURCE PROBLEM: INEFFECTIVENESS ENERGY USE - EQUIPMENT AND FACILITIES
Inefficient use of energy in the Farm Operation increases dependence on non-renewable energy sources that can be addressed through improved energy efficiency and the use of on-farm renewable energy sources. As an example, this concern addresses inefficient energy use in pumping plants, on-farm processing, drying and storage.
COMMON CONSERVATION PRACTICES USED

372 Combustion System Improvement
Replace older inefficient combustion engines with newer, more fuel efficient engines to reduce energy use.

RESOURCE PROBLEM: INEFFICIENCY ENERGY USE - FARMING/RANCHING PRACTICES AND FIELD OPERATIONS

Inefficient use of energy in field operations increases dependence on non-renewable energy sources that can be addressed through improved efficiency and the use of on-farm renewable energy sources.

COMMON CONSERVATION PRACTICES USED

533 Pumping Plant
Install a new water pump that reduces energy use. Replace pumping plants that rely on non-renewable energy sources with pumping plants that use wind, solar, or other on-farm renewable energy sources.

RESOURCE PROBLEM: AIR QUALITY IMPACTS - EMISSIONS OF PARTICULATE MATTER (PM) AND PM PRECURSORS

Direct emissions of particulate matter (dust and smoke), as well as the formation of fine particulate matter in the atmosphere from other agricultural emissions (ammonia, NOx, and VOCs) cause multiple environmental impacts, such as: - The unintended movement of particulate matter (typically dust or smoke) results in safety or nuisance visibility restriction - The unintended movement of particulate matter and/or chemical droplets results in unwanted deposits on surfaces - Increased atmospheric concentrations of particulate matter can impact human and animal health and degrade regional visibility.

COMMON CONSERVATION PRACTICES USED

373 Dust Control on Unpaved Roads and Surfaces
Apply road surface treatments that will reduce dust emissions from vehicular traffic on farms roads.

342 Critical Area Planting
Establish vegetation on highly erosive soils that generate excess dust.

472 Access Control
Control access of livestock, equipment, and vehicles to highly erosive areas that generate excess dust and other particulate matter.
Prescribed Grazing
Manage the location, timing, duration, and intensity of livestock grazing to maintain vegetative cover to prevent wind erosion and dust emissions.

Combustion System Improvement
Replace or retrofit agricultural combustion systems or devices to reduce particulate matter (PM-10, PM-2.5) emissions.

RESOURCE PROBLEM: AIR QUALITY IMPACTS - EMISSIONS OF GREENHOUSE GASES (GHGs)
Emissions increase atmospheric concentrations of greenhouse gases.

COMMON CONSERVATION PRACTICES USED

Combustion System Improvement
Replace or retrofit agricultural combustion systems or devices to reduce carbon dioxide emissions.